EA Engineering, Science, and Technology, Inc., PBC

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14 November 2018

Ms. Katrina Higgins-Coltrain
Task Order Monitor
U.S. Environmental Protection Agency (EPA) Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

RE: Site Management Plan, Revision 01
Wilcox Oil Company Superfund Site
Remedial Investigation/Feasibility Study
Remedial Action Contract 2
Contract: EP-W-06-004
Task Order 68HE0618F0311

Dear Ms. Higgins-Coltrain:

EA Engineering, Science, and Technology, Inc., PBC (EA) is transmitting one electronic copy via email of the Site Management Plan (SMP), Revision 01 for the above-referenced Task Order. EA will also provide an email copy to the Oklahoma Department of Environmental Quality (ODEQ). The SMP, Revision 01 incorporates comments received on the SMP, Revision 00 from EPA on 7 November 2018.

Please do not hesitate to contact me at (972) 459-5038 if you have any questions.

Sincerely,

Patrick Appel
Project Manager

cc: Brian Delaney, EPA Contract Officer (letter only)
Todd Downham, ODEQ (electronic copy via email)
Tim Startz, EA Program Manager (letter only)
File

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TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA		DATE: **8 November 2018**	TRANSMITTAL NO.: **004**
TO: **Ms. Katrina Higgins-Coltrain** **U.S. Environmental Protection Agency Region 6**		FROM: **Patrick Appel** **EA Engineering, Science, and Technology, Inc., PBC**	
SUBTASK NO.	DELIVERABLE	NO. OF COPIES	
1.2.1	Site Management Plan, Revision 01 Wilcox Oil Company Superfund Site Remedial Design Bristow, Creek County, Oklahoma	EPA: 1 Electronic Copy via Email ODEQ: 1 Electronic Copy via Email	
ACCEPTANCE ACTION			
DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)		NAME/TITLE/SIGNATURE OF REVIEWER DATE	

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Site Management Plan
Remedial Design

Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

EPA Region 6 Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 68HE0618F0311

Prepared for

U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

Prepared by

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405 S. Highway 121
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November 2018
Revision: 01
EA Project No. 14342.169

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CONTENTS

ACRONYMS AND ABBREVIATIONS

yd^3	Cubic yards
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CO	Contracting Officer
EA	EA Engineering, Science, and Technology, Inc., PBC
EPA	U.S. Environmental Protection Agency
HASP	Health and Safety Plan
IDW	Investigation-derived waste
ODEQ	Oklahoma Department of Environmental Quality
PCMP	Pollution Control and Mitigation Plan
PPE	Personnel protective equipment
QA	Quality Assurance
RD	Remedial Design
ROD	Record of Decision
RI/FS	Remedial Investigation/Field Study
SAP	Sampling and Analysis Plan
Site	Wilcox Oil Company Superfund Site
SMP	Site Management Plan
SOW	Statement of Work
SVOC	Semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TOM	Task Order Monitor
VOC	Volatile organic compound

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1. INTRODUCTION

EA Engineering, Science, and Technology, Inc., PBC (EA) received the Statement of Work (SOW) for the Wilcox Oil Company Superfund Site (site) from the U.S. Environmental Protection Agency (EPA) under Remedial Action Contract No. EP-W-06-004. The SOW was issued by the EPA Contracting Officer (CO) on 2 August 2018 (EPA 2018a). Under this Task Order, EA is authorized to develop a Remedial Design (RD) for the site (EPA Identification No. OK0001010917).

This Site Management Plan (SMP) has been prepared to be used in conjunction with the Health and Safety Plan (HASP) (EA 2016a) and Sampling and Analysis Plan (SAP) (EA 2016b), the latter two of which were prepared under the Remedial Investigation/Feasibility Study (RI/FS) Task Order. The culmination of these plans presents the overall approach for implementing RD activities. Specifically, the SMP provides details pertaining to: site security, site access, health and safety, contingency procedures, waste disposal, management responsibilities, document management, project meetings, and audits during the RD. These procedures may be modified during field activities in response to unanticipated or changing conditions with the EPA approval in the form of a field change form (Appendix A).

EA has incorporated the following site-specific plans into the SMP:

- Pollution Control and Mitigation Plan (PCMP)
  - — Appendix B includes the PCMP which outlines the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released offsite during the implementation of the investigation.
- Contingency Plan
  - — Section 5 of this SMP and Sections 3 and 5 of the PCMP (Appendix B) address emergency procedures/contacts in the event a release of contaminants were to occur (or is discovered), and/or if other emergencies such as fires or inclement weather conditions occur during the implementation of RD field activities.
  - — Section 6 of the HASP (EA 2016a) prepared under the RI/FS Task Order describes emergency recognition, pre-emergency planning, and procedures for handling emergency incidents, as well as emergency contact information and responsibilities.
- Waste Management Plan
  - — Section 6 of this SMP and Section 4 of the PCMP (Appendix B) address management, transportation, and disposal of wastes resulting from RD field activities.

- Data Management Plan

  — Appendix C includes the Data Management Plan which outlines the procedures for storing, handling, accessing, and securing data collected during the RD.

- Air Quality Monitoring Plan

  — Section 3.4 of the HASP (EA 2016a) outlines the air monitoring procedures and protocols for protecting workers during field activities.

The EPA Region 6 Task Order Monitor (TOM), Ms. Katrina Higgins-Coltrain, is responsible for the RD oversight. The Oklahoma Department of Environmental Quality (ODEQ) Project Manager is Todd Downham. The EA Project Manager, Mr. Patrick Appel, is responsible for implementing all activities required by this Task Order. Figure 1 presents the proposed project organization for this Task Order.

1.1 SITE DESCRIPTION

The Wilcox site is an abandoned and demolished oil refinery and associated tank farm and is located north of Bristow, Creek County, Oklahoma. The geographic coordinates of the site are approximately 35°50'31" North latitude and 96°23'02" West longitude. Wilcox Oil Company operated as a crude oil refinery from the 1920s until the property was sold by Wilcox Oil Company on 1 November 1963. A modern skimming and cracking plant was constructed in 1929. The upgraded facility had an operating capacity of 4,000 barrels of crude oil per day. The main components of the system consisted of a skimming plant, cracking unit, and redistillation battery with a vapor recovery system and continuous treating equipment. The crude oil was brought directly from the field, eliminating storage and handling facilities, but resulting in crude with high bottom sediment and water. The Wilcox Oil Company expanded operations by acquiring the former Lorraine Refinery facility west of the railroad and the tank farm area to the east of the refinery.

The site includes remnants of former oil refining operations and tank farms. The facility can be divided into five major former operation areas: the Wilcox Process Area, the Lorraine Process Area, the East Tank Farm, the North Tank Farm, and the Loading Dock Area. An active railroad divides the two former process areas and product storage areas.

Site investigations have been performed by EPA and the ODEQ since 1994 and include the following:

- During May/June/July 2015, EPA performed residential soil sampling and fenced potential exposure areas to restrict access. This is documented in the Removal Assessment Report for Wilcox Oil Company (Weston Solutions Inc. 2016).

- EPA conducted a geophysical survey, a Rapid Optical Scanning Tool laser-induced fluorescence survey, and a field-portable X-ray fluorescence survey across portions of the Wilcox and Lorraine Process Areas and the East Tank Farm between 30 November through 16 December 2015. These activities are documented in the Trip Report; November 30 through December 16, 2015, Wilcox Oil Company Superfund Site (LMS 2016).

- Phase 2 – Mobilization 1, Field Events 1, 2, 3, and 4 occurred August 2016–April 2017 and included: Passive Soil Gas Sampling, Vapor Intrusion Sampling, Residential Well Sampling, Soil Sampling, Naturally Occurring Radioactive Material Survey (ODEQ 2016), and Sand Creek Surface Water Sampling (Field Event Sampling Data, unpublished).

- Removal Action – Occurred September/October 2017 and included removal of approximately 1,349 tons of tank waste from a residential property. The area was backfilled with clean dirt, graded, and re-seeded (Weston Solutions Inc. 2017).

- Phase 2 – Mobilization 2, Field Event 5 occurred October/November 2017 and included: soil, sediment, and surface water sampling (Field Event Sampling, unpublished).

- Phase 2 – Mobilization 2, Field Event 6 occurred March 2018 and included soil sampling in the North Tank Farm (Field Event Sampling, unpublished).

On 5 September 2018 a Source Control Record of Decision (ROD) (EPA 2018b) was issued to implement an early action limited in scope to address tank waste and the lead additive area. The site-wide selected remedy consists of three remedial components as described in the ROD Section 19.1–19.2 and include the following:

- Excavation: Approximately 2,269 cubic yards (yd^3) of lead additive area source material and 28,093 yd^3 of tank waste source material will be excavated for a total of approximately 30,362 yd^3. Excavated areas will be sampled, backfilled with clean soil from an offsite location, and re-vegetated. All excavated areas will be graded for drainage.

- Treatment: Approximately 2,269 yd^3 of lead additive area source material will be treated through stabilization/solidification.

- Offsite Disposal: All excavated and treated source material will be transported to an offsite permitted and regulated disposal facility.

1.2 PURPOSE OF THE REMEDIAL DESIGN

The purpose of this RD is to perform all field activities and multimedia environmental necessary to support preparation of the RD. Field activities include:

- **Treatability Study Sample Collection** — EA will collect soil samples from the Wilcox Process lead additive area and submit to three potential vendors to perform laboratory bench-scale treatability studies. A portion of each sample will also be submitted to separate laboratories for analysis of metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons, Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP SVOCs, TCLP VOCs, reactivity, corrosivity, and ignitability. In addition, up to three samples will be collected for geotechnical analysis and include porosity, grain size, density, and moisture content. Samples will be submitted to EPA Contract Laboratory Program (CLP) and non-CLP private laboratories.

- **Treatability Study Field Pilot Testing** — EA will provide onsite material from the Wilcox Process lead additive area to three stabilization/solidification vendors for bench scale testing. EA will review the results, select a recommended vendor in the design, and present the findings to EPA. If EPA concurs, a field pilot test to verify treatability will be performed. If the initial field pilot test does not meet performance criteria, then additional field testing may be performed. During each field pilot test approximately 15 yd^3 of material from the lead area will be mixed with the amendment for each pilot test.

- **Investigation-Derived Waste (IDW) Transportation and Disposal** — Solid IDW will be generated during field pilot testing. Each test will generate approximately 15 yd^3 of material. The IDW will be characterized and transported and disposed of at a permitted disposal facility. All disposal transport vehicles will be decontaminated prior to leaving the site, source materials within the bed of the truck will be covered with a tarpaulin sheet, and will only transport material via the pre-approved transportation route. Liquid IDW will consist of decontamination water collected during the decontamination activities. The liquids will be placed in liquid containers and secured at the site staging area until it is characterized, transported, and disposed of at a permitted disposal facility.

The following sections discuss site security (Section 2), site access (Section 3), health and safety (Section 4), contingency procedures (Section 5), waste disposal (Section 6), management responsibilities (Section 7), document management (Section 8), project meetings (Section 9), and audits (Section 10).

2. SITE SECURITY

The Support Zone for field management and sample processing/analysis will be situated near the area of investigation. Storable tools, instruments, and equipment will be collected at the end of the shift or workday, and will be either taken offsite for storage or stored within the Support Zone in a secured storage unit.

The Site Manager, the Site Health and Safety Officer, or appropriate designee will be responsible for controlling unauthorized entry during work hours. Should persons attempt unauthorized site

entry, the Site Manager will be responsible for taking appropriate action. The Site Manager or Site Health and Safety Officer will be responsible for logging in equipment, materials, visitors and vehicles into and out of the site.

A Daily Site Log will also be kept for all personnel visiting the site. The log will include: (1) date of each person's visit to the site; (2) person's name, signature, and organization; and (3) time of site entry and exit. A sample Daily Site Log is included in Appendix B in the HASP. Any visitors to the site must present proper identification and be authorized to be onsite. Visitors must comply with all provisions of the HASP. The Site Health and Safety Officer will identify work areas that visitors or personnel are authorized to enter and will enforce site control measures.

The principal objectives of site security are summarized below:

- Deter, restrict, and control financial losses (as applicable) to the government and the contractor(s), which would include prevention, detection, and reporting of theft, vandalism, sabotage, etc.
- Keep unauthorized people from entering the site and being injured or exposed to hazardous conditions and waste.
- Keep unauthorized people from entering the site and removing mechanical or monitoring equipment, small tools, fuel, and stored site material, and from releasing hazardous substances onsite or offsite.
- Keep unauthorized people from taking action(s) at the site that might exacerbate the environmental problem or interfere with investigation activities.
- Keep unauthorized people from removing file information located onsite.
- Prevent unauthorized dumping onsite.

3. SITE ACCESS

The RD field activities will be performed at the Wilcox Process Area, which is a subsite of the site. EA will support the EPA TOM in conducting community involvement activities as directed by the EPA TOM. EPA indicated that it would coordinate and provide access agreements for the properties that are subject to investigation.

Work areas on or near the Support Zone will be restricted to EPA, ODEQ, EA, or other appropriate personnel. No other persons will be granted access to the Support Zone during RD field activities without the consent of EPA and/or EA in the event EPA is not present with work is being conducted.

4. HEALTH AND SAFETY

All personnel performing field activities at the site will be trained in appropriate safety procedures as set forth in the Titles 29 and 40 of the Code of Federal Regulations (CFR), specifically 40 CFR Part 265.16 (EPA 2012), 29 CFR Part 1910 (OSHA 2013), and 29 CFR Part 1926 (OSHA 2018). During non-intrusive activities, non-trained personnel will be allowed onsite. These personnel may be restricted to certain areas of the site. The regulations in 29 CFR have been enacted to ensure a safe working environment for the United States labor force. In addition, medical monitoring will be required for personnel who will come into close contact with contaminated soils. The HASP provides more specific health and safety information for the project.

All onsite personnel will be informed of the possible dangers and long-term hazards present at the site in compliance with the "right-to-know" laws.

5. CONTINGENCY PROCEDURES

The potential does exist for a spill of waste materials (e.g., decontamination water and/or soil samples) to occur during the handling of these materials, which could result in an operational emergency. In addition, potential natural emergencies include storm flooding, fires, high winds, dust storms, and extreme heat/cold.

In the event of a fire, explosion, or accidental material release, the response action will be governed by an evaluation of the severity of the event. The Site Health and Safety Officer, or other EA representative, will evaluate the situation. An emergency response action will be taken if the Site Health and Safety Officer or other representative determines that an emergency situation exists. Section 3 of the PCMP (Appendix B) provides a discussion of controls for chemical releases, and also lists emergency contact numbers to be used in the event a major release were to occur. Section 5 of the PCMP (Appendix B) provides emergency response contacts, and describes emergency procedures to be implemented should an emergency occur.

Storm flooding, fires, and other conditions may warrant evacuation of site personnel and equipment. Offsite evacuation will be necessary if fire or fumes threaten to spread to offsite receptors. The HASP provides more specific health and safety information.

6. WASTE DISPOSAL

Solid and liquid IDW generated during field activities may include: field pilot testing waste, decontamination fluids of sampling equipment and trucks used during the field pilot test, personal protective equipment (PPE), and other ancillary investigatory wastes.

Solid and liquid IDW will be managed as separate waste streams, and will be drummed, labeled, stored in a designated waste storage area within the Support Zone, and then sampled. Following receipt of analytical data, a subcontracted waste disposal company will remove and transport the investigation-derived waste to a permitted disposal facility. EA will perform field-generated waste (e.g., IDW) characterization and disposal in accordance with local, State, and Federal regulations.

7. MANAGEMENT RESPONSIBILITIES

Implementation of RD field activities at the site will involve several groups and individuals. This section summarizes the roles and responsibilities of the groups and individuals involved. The HASP provides a detailed description of the health and safety related individuals and their roles in the investigation. Figure 1 presents the proposed project organization for this Task Order.

7.1 U.S. ENVIRONMENTAL PROTECTION AGENCY

Field activities will be conducted in accordance with the EPA RD SOW (EPA 2018a) and the EPA-approved RD Work Plan (EA 2018). The EPA TOM will communicate directly with the EA Project Manager regarding any concerns about the scope, budget, schedule, and/or quality.

7.2 EA PROJECT MANAGER

The EA ***Project Manager*** will serve as the point-of-contact for EPA and will be responsible for managing the schedule, tracking project costs, and providing general project management.

7.3 SITE MANAGER

The ***Site Manager*** will be responsible for: (1) interfacing with the Project Manager, subcontractors, and site staff; (2) documenting RD progress; (3) providing quality assurance (QA) oversight of site staff and subcontractors; and (4) certifying that RD activities are completed in accordance with project plans. The Site Manager will manage the daily activities at the site and will coordinate communications between subcontractor, local emergency response, local government, EPA, and ODEQ personnel as appropriate.

7.4 SITE HEALTH AND SAFETY OFFICER

The ***Site Health and Safety Officer*** will be responsible for ensuring compliance with the HASP. The Site Manager may also serve as Site Health and Safety Officer. The Site Health and Safety Officer will also be responsible for providing technical coordination of the health and safety program. The Site Health and Safety Officer will be appointed and employed by EA and will be responsible for site implementation and enforcement of the HASP as well as any contingency procedures. The Site Health and Safety Officer will have advanced field work experience and will be familiar with health and safety requirements specific to the project. The Site Health and Safety Officer will conduct the daily safety meeting the morning of each field day and ensure that the safety meeting sign-off sheet is signed by all personnel who are to perform field work. The Site Health and Safety Officer also must ensure that each field worker signs a daily site log before entering and leaving the site. The Site Health and Safety Officer will designate areas/field personnel requiring air monitoring.

The Site Health and Safety Officer will be the liaison with the officers and representatives of EPA on matters relating to health and safety. The Site Health and Safety Officer will be responsible for maintaining up-to-date records of HASP-related documentation and HASP participants. HASP-related documentation will include training records for each worker relevant to his or her job. Project employees who do not meet HASP requirements will not be allowed to conduct field work.

7.5 QUALITY ASSURANCE OFFICER

The EA ***QA Officer*** will be responsible for conducting audits and reviews of all work performed. The QA Officer issues recommendations to the technical staff and management about quality performance. The QA Officer will also provide recommendations and orders, as required, for corrective action for all aspects of work that do not meet EA and EPA standards. The QA Officer will confirm compliance with corrective action orders and recommendations.

8. DOCUMENT MANAGEMENT

This section provides the project filing requirements.

8.1 DOCUMENT CONTROL

EA has implemented control procedures for project documents prepared by EA, team subcontractors, non-team subcontractors, and vendors. Project documents will be stored in dedicated project files, to be maintained in central, lockable filing cabinets in the office in which the project is managed, rather than project staff members' individual offices, in order to provide control and confidentiality of documents and reports. Quality records and related documents will be stored in a dedicated section of the project file.

Each project file will contain a master list of documents, indexed to the appropriate file section. Each draft or obsolete document will be discarded or destroyed after the final or next revised draft version is completed.

Documents will be available for use by appropriate members of the project team, but return of project documents to the central file will be required when active use is no longer required. Prior to removing a document from the file, project personnel will be required to fill out a sign-out sheet, indicating the document name, employee's name, and date signed in and out.

8.2 DOCUMENT DISTRIBUTION

In general, documents will be distributed as needed to project personnel. For project-related documents, the Project Manager will distribute technical procedures, drawings, and specifications. The Project Manager will distribute this SMP and any revisions to this plan to project team members.

8.3 DOCUMENT STATUS

To prevent inadvertent use of obsolete or superseded project-related information, members of the Site Manager's project team are responsible for reporting document changes to the Project Manager. The Project Manager will coordinate with other management team members by notifying project personnel of changes in project document status. Outdated material will be purged to prevent further use.

8.4 DOCUMENT FILING AND MAINTENANCE PROCEDURES

Home office filing procedures will be consistent with the procedures established under EA's Quality Management Plan (EA 2015). Duplicate files regarding site-related work will be maintained at the site under the Site Manager's control. At a minimum, one copy of the following documentation will be maintained at the site:

- Health and safety records
- QA records
- Project plans, including the HASP, SAP, and this SMP
- Copies of pertinent correspondence
- Data collected as part of RD activities.

In addition, relevant regulatory requirements and information (e.g., EPA-issued documents) will be maintained at all times. At least once per week, file information generated onsite and copies of electronic data will be copied or placed on compact disc for transmittal to the EA Dallas

office. The working EPA Task Order file will be maintained at the EA Dallas office. At the completion of the Task Order, onsite file information, including electronic data, will be maintained at the EA Dallas office, with transfer of Task Order closeout files to EPA, per contractual document retention requirements.

8.5 DEVIATION PROCEDURES

Deviations from EPA-approved plans are common during an RD field program. Change does not imply nonconformance, but instead means that original plans must be altered because of new information or events that occur during the work. Changes may have no effect on the final work product or may require redirection of the work so that a different result becomes necessary, as long as the end product is consistent with the EPA-approved Work Plan (EA 2018a) and site-specific plans.

Changes must be documented, evaluated, and reported to project management personnel. Change management ensures that the actual course of the project, not the original plan, can be demonstrated and justified. Project personnel will be responsible for recording changes and providing documentation to project management, QA, or subcontractor management personnel. In addition, the Project Manager will be notified of potential changes that could cause the Site Manager to redirect the work effort. Discussions of deviations to the SAP or other site-specific plans will be recorded in the field logbook.

Contract Field Change Forms (Appendix A) are the mechanisms by which changes to the EPA-approved Work Plan and/or EPA SOW are documented. The EPA Contracting Officer (Mr. Brian Delaney) will be immediately informed of any scope, schedule, or budget implications. When the EA Project Manager identifies a variance in activities from the approved Work Plan, such as a change in scope, cost, or schedule, the EA Project Manager will notify the EA Program Manager, Financial Manager, and EPA TOM. The EA Project Manager will then complete and submit a Contract Field Change Form to the EA Program Manager and Financial Manager for transmittal to the EPA Contracting Officer. The Contract Field Change Form process is not complete until the task order budget has been adjusted, if necessary, and EPA has approved or disapproved the Contract Field Change Form. No work associated with the change will proceed without a properly executed and signed Contract Field Change Form.

9. PROJECT MEETINGS

The project will require open house meetings during project activities. EA will provide support to EPA. This section discusses attendance requirements and topics for these meetings.

9.1 INVESTIGATION/KICKOFF MEETING

The Project Manager will schedule and conduct a meeting during initial mobilization and performance of field activities. The Project Manager, Site Manager, Site Health and Safety Officer, and other appropriate personnel will attend the meeting. Minimum agenda items that attendees must be prepared to discuss include the following:

- Introduction of representatives and their respective roles
- Overview of proposed field work, and methodologies/procedures for gathering data
- Tentative schedule
- Relation and coordination of subcontractors, as required
- Adequacy and distribution of contract documents
- Procedures for maintaining records
- Use of project premises
- Requirements for PPE and health and safety requirements.

9.2 PERIODIC MEETINGS

For the duration of site activities, the Site Manager will schedule and conduct periodic progress meetings at the site. The Site Manager, who is responsible for maintaining accurate meeting minutes, will chair the meeting. The Site Manager will be responsible for distributing the meeting minutes to attendees, and program management personnel. The Project Manager, Site Manager, Site Health and Safety Officer, and other appropriate personnel will attend the meeting. Minimum agenda items that attendees must be prepared to discuss include the following:

- Review of work progress since the last meeting
- Site observations, problems, and decisions
- Problems that may impede planned progress
- Safety-related observations, incidents, or potential safety problems and the corrective action(s) taken to mitigate the problem(s)
- Corrective measures and procedures to regain the planned schedule, if required
- Work scheduled for the next work period.

10. AUDIT PROCEDURES

Audits ensure that the work is performed accurately, safely, and within contract and schedule constraints. This section discusses site audits, site audit reports, and health and safety audits.

10.1 SITE AUDITS

A site audit may be performed by the QA/quality control manager as necessary during the course of the project to observe general conformance with project requirements. The scope of site audit is summarized below:

- During the site audit, only general visual observations and file reviews will be performed.
- Not every element and component indicated in the RD plans will be observed during the site audit.

10.2 SITE AUDIT REPORTS

A written report documenting each site audit will be prepared for the project file; the Project Manager, Site Manager, and relevant subcontractor management personnel will receive copies. The report should include the following information:

- Reason for the audit
  - Fulfill contract requirements
  - Conduct a planned general observation visit
  - Resolve an error or omission
  - Resolve a problem.
- Date and time of the audit
- Weather conditions during the audit
- Individuals present during the audit
- Work processes observed, such as site or office work
- Specific conditions observed
- Specific conditions resolved or discussed during the audit
- Site conditions that require future investigation and resolution

- Corrective action, if any, forwarded to the subcontractors through the Project Manager and Site Manager

- Photographs taken, if any

- Follow-up actions, if required
  - Identification of the party responsible for the action, and
  - Timeframe and schedule to complete the action.

10.3 SAFETY AND HEALTH AUDITS

A health and safety audit may be performed during RD field activities. Additional health and safety audits may be arranged with the Project Manager and Site Manager under the following conditions:

- Significant deficiencies are noted during the initial audit

- Lost-time accident occurs onsite

- Project management determines that an additional audit is necessary.

11. REFERENCES

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———. 2018a. RAC II Statement of Work for Remedial Design Wilcox Oil Company Superfund Site, Bristow, Creek County, Texas. 2 August.

———. 2018b. Record of Decision Wilcox Oil Company Superfund Site, Creek County, Texas. 5 September.

Figure 1

Project Organization

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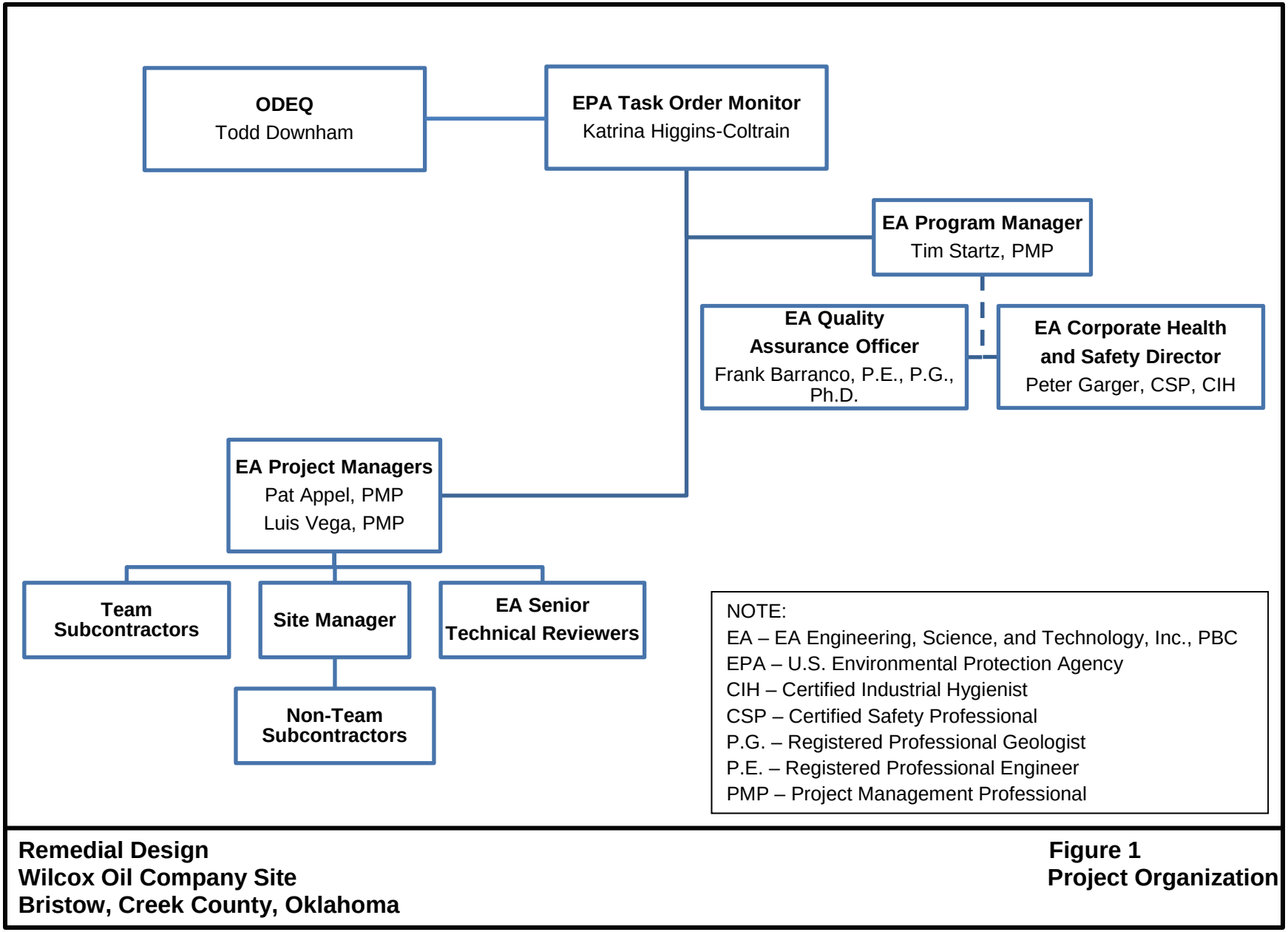

Remedial Design
Wilcox Oil Company Site
Bristow, Creek County, Oklahoma

Figure 1
Project Organization

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Appendix A

Contract Field Change Form

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CONTRACT FIELD CHANGE FORM

Project Name	Document Name	Task Order No.
Wilcox Oil Company Superfund Site	Field Change Form No. 1	68HE0618F0311
Contract No. EP-W-06-004		Date

Scope of Work for Field Change Form:

Reason for Action:

COST DATA

Item Description (attach specifications, if necessary)	Estimated Quantity	Unit	Unit Rate	Line Item Total
			Original Reserve Funding	
			Subtotal for this field change form	
			Plus total for all previously submitted field change forms	
			Balance of Original Reserve Funding (upon approval of field change form)	
			G&A (11.43% of Non-Labor Subtotal for this field change form)	

Schedule Impact (Calendar Days):

SIGNATURES

Resident Engineer	Financial Manager	Project Manager	EPA Approval
Date	Date	Date	Date

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Appendix B

Pollution Control and Mitigation Plan

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Pollution Control and Mitigation Plan

Remedial Design
Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

EPA Region 6 Remedial Action Contract 2
Contract: EP-W-06-004
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Prepared for

U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
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ACRONYMS AND ABBREVIATIONS

EA	EA Engineering, Science, and Technology, Inc., PBC
EPA	U.S. Environmental Protection Agency
HASP	Health and Safety Plan
IDW	Investigation-derived waste
PPE	Personal protective equipment
RD	Remedial Design
SDS	Safety Data Sheet
Site	Wilcox Oil Company Superfund Site

1. INTRODUCTION

EA Engineering, Science, and Technology, Inc., PBC (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract Number EP-W-06-004, Task Order 68HE0618F0311, to conduct a Remedial Design (RD) at the Wilcox Oil Company Superfund Site (Site).

The purpose of this Pollution Control and Mitigation Plan is to summarize the requirements and procedures designed to protect the environment during RD field activities. These requirements and procedures pertain to:

- Storage and disposal of solid and liquid investigation-derived waste (IDW).
- Handling, transportation, and disposal of solid and liquid IDW generated as part of the assessment activities.

This Pollution Control and Mitigation Plan will be amended, as necessary, to ensure continued environmental protection at the Site. The following sections provide procedures on discharge control (Section 2), control of chemical releases (Section 3); equipment and personal protective equipment (PPE) decontamination (Section 4), and emergency procedures (Section 5).

2. DISCHARGE CONTROL

Solid and liquid investigative derived waste (IDW) generated during field activities may include; field pilot testing waste, and, decontamination fluids of sampling equipment, and personal protective equipment (PPE), and other ancillary investigatory activities. IDW generated as part of RD activities will be subject to disposal as appropriate.

Solid and liquid IDW generated during the field investigation will be managed as separate waste streams, and will be drummed, labeled, stored in a designated waste storage area within the Support Zone, and then sampled. Following receipt of analytical data, a subcontracted waste disposal company will remove and transport the investigation-derived waste to a proper disposal facility. EA will perform field-generated waste (e.g., IDW) characterization and disposal in accordance with local, State, and Federal regulations.

To mitigate the potential for discharge of IDW during RD field activities, the IDW storage area within the support zone will be secured and clearly marked to prevent the accidental discharge of IDW. While conducting intrusive activities that may create IDW (e.g., field pilot testing) in or near these sensitive areas, pollution control measures will be employed to mitigate unintentional discharge of IDW.

3. CONTROL OF CHEMICAL RELEASES

When an unplanned chemical or hazardous material release occurs, the Site Health and Safety Officer will immediately identify the characteristics, source, amount, and extent of the released material. If the release involves chemicals, Safety Data Sheets (SDSs) will be used to define the degree of hazard associated with the incident. SDSs and shipping manifests will be maintained in the EA Site Manager's office.

The Site Health and Safety Officer will help officials assess any incidents and implement any evacuation. Information provided by the Site Manager will include, but not be limited to, the following:

- Name and telephone number of person reporting the incident;
- Name and address of the incident location;
- Time and type of incident (e.g., chemical release);
- Name and quantity of material(s) involved, to the extent known;
- Extent of any injuries, if known; and
- Potential hazard to human health and the environment outside the Site.

A reportable release, fire, or explosion that impacts off-site areas or has the potential to impact off-site areas will be reported to the appropriate administrative agencies. These agencies and contact numbers are as follows:

• Fire and police departments	911
• National Response Center	1-800-424-8802
• EPA	1-866-EPASPILL
• Environmental Emergencies Hotline	(1-866-372-7745)
• Oklahoma Department of Environmental Quality	1-800-522-0206
• Non-emergency police, Bristow Police	1-918-367-2251
• Non-emergency, Creek County Sheriff	1-918-227-6374
• Poison Control Center	1-800-222-1222
• Bristow Medical Center	1-918-367-2215

4. EQUIPMENT AND PPE DECONTAMINATION

Wastewater will be generated during the decontamination of sampling equipment and/or PPE. Decontamination shall be conducted in accordance with the site-specific Health and Safety Plan (HASP) and Sampling and Analysis Plan. IDW will be temporarily stored (e.g., in drums) and later be transported for disposal. IDW will be disposed of in accordance with local, State, and Federal regulations. The Project Manager must approve the disposal method.

5. EMERGENCY PROCEDURES

In case of an emergency that may cause harm to human health and the environment, the Site Health and Safety Officer will implement the site emergency procedures specified in the HASP. As discussed in the HASP, the Site Health and Safety Officer is responsible for the following specific activities:

- Implementing the site contingency plan, including ordering site evacuations, directing fire-fighting efforts, and directing spill control and cleanup.
- Contacting and coordinating with local emergency services such as the fire department; ambulance services; and Federal, State, or local emergency or environmental agencies.
- In the event of an airborne release of toxic materials, informing local authorities immediately to assess the need for evacuating the public near the Site.
- Determining the cause of the incident and how to prevent it in the future.
- Filing necessary reports with Federal, State, and local authorities, and completing a written report for the EA Project Manager.

The Site Health and Safety Officer will work closely with the Site Manager in the event of an emergency and will provide advice and support, as necessary. The Site Health and Safety Officer will be responsible for the following additional activities in the event of an emergency:

- Evaluate the emergency conditions and make recommendations regarding:
  - Risks to off-site personnel and the public
  - Necessity of upgrading PPE to protect on-site personnel/emergency responders
  - Evacuation of on-site personnel
- Supervise evacuation and decontamination procedures
- Obtain first-aid services and medical support for injured or exposed personnel
- Contact EA Project Manager as soon as possible regarding any accident or injury other than minor first-aid cases
- Prepare written incident report for submission to the Site Manager and EA Project Manager within 24 hours of the incident that will include items identified in the HASP.

If the Site Health and Safety Officer is absent or incapacitated, the Site Manager or designated alternate will assume the responsibility of the Site Health and Safety Officer during the emergency. On-site employees are responsible for: (1) reporting emergency situations or

conditions immediately to their supervisors; (2) alerting other employees; (3) helping injured personnel only when their personal safety is assured; and (4) assisting as directed in the mitigation of the incident.

Neither the Site Health and Safety Officer nor the subcontractors will order or conduct evacuations of the general public. The Site Health and Safety Officer will make recommendations to the local emergency authority and assist when possible. However, the local agency in charge will decide whether evacuation is required. In the event of a fire or explosion, the local fire department will be summoned immediately. Upon his or her arrival, the Site Health and Safety Officer or designated alternate will advise the fire commander of the location and nature of the incident and identify the hazardous materials on-site.

Spills of hazardous materials shall be corrected and controlled as soon as possible. Primary attention shall be given to the protection of life (on- and off-site), and the prevention of spill dispersion. Although, no spills are anticipated during RD field activities, any spills that occur will be cleaned up within the same workday period in accordance with proper procedures as directed by the HASP. In addition, Applicable or Relevant and Appropriate Requirements identified in the September 2018 ROD regarding spills will be followed.

Appendix C

Data Management Plan

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Data Management Plan for
Analytical and Geographic Information System Data

Remedial Design
Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

EPA Region 6 Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 68HE0618F0311

Prepared for

U.S. Environmental Protection Agency
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November 2018
Revision: 01
EA Project No. 14342.169

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ACRONYMS AND ABBREVIATIONS

DMP	Data Management Plan
EDD	Electronic data deliverable
ESRI	Environmental Systems Research Institute, Inc.
GIS	Geographic Information System
RDBMS	Relational database management system
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
Site	Wilcox Oil Company Superfund Site

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1. INTRODUCTION

This Data Management Plan (DMP) describes the design, development, maintenance, and intended uses of the analytical and spatial databases for the Remedial Design associated at the Wilcox Oil Company Superfund Site (Site).

The purpose of this DMP is to define: (1) how a relational database management system (RDBMS) and Geographic Information System (GIS) are assembled and maintained; and (2) how each system can be accessed by Task Order personnel. This DMP also explains how the RDBMS attribute and GIS spatial components will interact to provide users with easy visual access to the vast amount of available data (e.g., laboratory data, survey data, etc.). Procedures for populating information stored in the RDBMS and GIS, and for linking the two systems are addressed in this DMP.

A comprehensive data management program is designed to assure that: (1) multiple information sources will result in similar data sets; and (2) data management practices will be adequate for the types of data processing required by a task order. All site team members will follow these protocols to assure results will have uniform units of measure, analytical methods, and reporting forms.

Section 2 describes the RDBMS analytical database design and functionality; software and hardware; procedures for database administration and implementation; and data retrieval, output, and use. Section 3 describes the GIS spatial database design and functionality, GIS hardware and software, procedures for GIS spatial database administration, coordination with the RDBMS, and GIS map generation.

2. RELATIONAL DATABASE MANAGEMENT SYSTEM FOR ANALYTICAL DATA

The following subsections provide an overview of environmental sampling and analysis and discuss relational database structure and function, software and hardware requirements, and processing of the analytical data into the database system.

2.1 ENVIRONMENTAL SAMPLING AND ANALYSIS OVERVIEW

The planning, collection, analysis, and reporting of chemical data for environmental samples are each complex process, with many variables to track. The major steps in collecting and processing environmental chemical data are summarized for the purpose of later defining how the data are processed and stored in the database system. The main steps include:

- ***Site Investigation Planning***—There are various types of investigations (e.g., site reconnaissance, soil sampling, etc.) that will be conducted at the Site. Site investigation plans are developed to define the proposed sampling locations, sampling dates and times, matrices, sample depths, field sample naming conventions, numbers and types of field quality control samples (e.g., field blanks, field duplicates, trip blanks, etc.), proposed analytical methods, and required detection limits. The investigation plan information is

useful to the database administrator for planning the electronic data processing procedure and storage requirements.

- ***Establishing Data Quality Objectives***—A detailed data quality objective plan provides the laboratory with critical information regarding required methodologies, analyte lists, detection limits, and quality control specifications that must be met. This information is also useful to the database administrator for planning the electronic data processing procedure and storage requirements.

- ***Sample Collection***—Environmental chemical data associated with a given site investigation are typically collected at multiple sample locations and for multiple depths (e.g., 0 to 2 feet below ground surface). A single sample may be collected in multiple containers required for various analytical methods. A single sample may also have various containers sent to multiple laboratories for specialized or confirmatory analyses. All field sampling information (i.e., field sample names, sample collection dates and times, and required analyses) are recorded on a chain-of-custody provided by the laboratory.

- ***Laboratory or Field Laboratory Analysis***—The laboratory or field laboratory data have the responsibility for meeting all data quality objectives supplied by the client. Data quality objectives may vary greatly on the level of quality control and level of reporting detail required for the task order. Samples may require re-analysis, dilutions, and analysis of internal quality control samples (i.e., duplicates, surrogate spikes, and matrix spikes). The laboratory applies many types of internal laboratory quality control processes and reviews, and finally reports the data with qualifiers and narratives describing any situations involving method or sample analysis performance problems.

- ***Final Reported Data***—The client data quality objectives usually specify the level of detail reported to the client, including or excluding internal quality control results (e.g., laboratory duplicates, matrix spike recoveries, calibration verification, etc.). The data are provided to the client as hard copy reports, and electronic data deliverables (EDDs). The structure of the EDD is dictated by the client.

- ***Data Validation***—This is an optional procedure required for some Task Orders. After the laboratory generates its final reportable results, in hard copy (and electronically), the laboratory data packages are submitted to independent, data validators, who perform a complete review of the data against all relevant data specifications and resolve issues such as multiple dilutions and/or multiple analyses supplied for the same sample. A final validated result and qualifier is supplied for each sample and its analytes. The task order may require storage of unvalidated and/or validated data.

- ***Final Data Storage***—The EDDs, particularly unvalidated EDDs, may be reviewed against the chain-of-custodies, project plan, data quality objectives, or other external master lists to ensure data completeness. The project manager must supply additional information that is not included in the EDD but is associated with the field samples. Additional information to be supplied includes:

— ***Sample Location***—Location codes, areas of concern, location types, or categories
— ***Sample Descriptors***—Field duplicate identities, depths, detailed matrix codes, sample types (e.g., normal, field duplicates, rinse blanks, etc.), and sample details (e.g., sieved, background, etc.)
— ***Data Reduction Policies***—Policies regarding if and/or how to store dilutions, re-analyses, unvalidated and validated data, confirmation data, multiple methods for the same sample and analyte, and laboratory quality control sample analysis results.

2.2 RELATIONAL DATABASE STRUCTURE AND FUNCTION

The following subsections discuss database structure, function, and objectives.

2.2.1 Structure

The relational database structure for storing sample and chemical data consists of a series of related data tables. Relational database structures are the most efficient way to store complex data. The main features of relational databases are:

- Data are stored in separate tables, such as tables for locations, samples, analytes, methods, tests, etc.

- Some tables function as reference tables to enforce standardization of defined values, (e.g., method names, analytes, concentration units, etc).

- The individual data tables are linked in parent-child relationships (e.g., a table of parent locations that is linked to a table of many child field sample records). Parent-child field relationships are enforced via indexed key fields to ensure that all child records are assigned to parent table records, thus eliminating the possibility of "orphaned" records. All parent-child tables are linked via unique indexed numeric keys.

- Each table has index keys and field constraints assigned to ensure that each record is unique, thus eliminating accidental storage of duplicated information in any table.

- Relational databases provide enormous flexibility in querying, summarizing, analyzing, exporting, and reporting large quantities of data.

A typical analytical database contains 22 tables as follows: (1) 16 reference tables that store standardized values and (2) 6 data tables that store the related site, location, sample, testing, results, and screening value data. A summary of the potential data tables is presented in Table 1. A general schematic of the potential database tables and relationships is presented in Figure 1.

TABLE 1 SUMMARY OF RELATIONAL DATABASE TABLES

Table	Contents	Relationship Notes
Action Limits	Stores the screening concentrations, units, for each action limit type.	
Action Limit Types (Reference)	Reference list of action limit types such for human health screening.	
Analyte Group Type (Reference)	Reference table that stores analyte groups to which individual analytes may be assigned.	
Analysis Methods (Reference)	Reference list of analytical method names used by the laboratory.	
Analyte List (Reference)	Reference list of chemical analyte names, includes no chemical field parameters, along with Chemical Abstract Services number and other analyte codes.	
Laboratories (Reference)	Reference list of laboratories or other subcontractors and the contact information.	
Laboratory Type (Reference)	Reference list of laboratory types to allow indication of off-site, field, mobile, etc.	
Location Points	Stores all sampling point location information (e.g., primary site, location types, location groups, or areas of concern, etc.).	Parent table of samples, child table of sites
Location Areas (Reference)	Reference list of location "areas" that may be used to group sampling location points.	
Location Type (Reference)	Reference list of sample location point types.	
Matrix Types (Reference)	Reference list of matrices (e.g., soil, water, etc.) that may be assigned to field samples.	
Matrix Group (Reference)	Reference list of matrix groups that may be used to group specific matrices.	
Preparation Methods (Reference)	Reference list of sample preparation method names used by the laboratory.	
Analysis Results	Stores the actual result detail for each unique sample and test. The results details include the reported result, units, various qualifiers, validated status, various detection limit types, detection flags, reportable status, and result type.	Child table of sample tests (sample tests)
Result Types (Reference)	Reference list of result types.	
Sites	Stores the primary sites included in a task order to which location points may be assigned.	Parent table of location points
Samples	Stores all sample information, such as field sample name, location point, depth, collection date/time, matrix, sample type (e.g., field duplicate, trip blank, matrix spike, etc.), sampling task. Also stores non-field samples (i.e., laboratory duplicates, matrix spikes, and other quality control samples).	Parent table of sample tests, child table location points

Table	Contents	Relationship Notes
Sample Tests	Stores the unique combination of the sample and analysis method performed on a given date/time as a "sample test." Includes the test information such as analysis and preparation dates/times, laboratory, analyst, batch, laboratory sample identification, sample delivery group, dissolved/total indicator, test type, laboratory report, chain-of-custody, etc.	Parent table of analysis results, child table of samples
Sample Type (Reference)	Reference list of sample types.	
Sampling Tasks (Reference)	Reference list of sampling tasks to allow grouping of samples into sample events, such as "2007-January".	
Test Types (Reference)	Reference list of analysis test types used to indicate re-analysis, dilutions, confirmations, etc.	
Concentration Units (Reference)	Reference list of concentration units used for results.	

2.2.2 Function and Objectives

Database structure and relationships address the following key data integrity issues:

- The critical quality of the database is that it must be flexible enough to allow storage of all desired results, without allowing duplicated records to be stored accidentally. The database must be able to accommodate data from other databases and external files.

- Each table has a combination of fields that are required to be unique. For example, the samples table will not allow the same point location, matrix, sample type, sample depth, and sample date/time to be entered more than once, otherwise this would be the same sample entered again.

- The database has built-in safeguards to prevent deleting parent data that have associated child data or adding child data that do not have a parent record.

- The use of reference tables forces method names, chemical names, units, and other standardized items to remain consistent throughout the database records.

2.3 SOFTWARE AND HARDWARE REQUIREMENTS

The following subsections discuss software and hardware requirements.

2.3.1 Defining the Requirements

The relational database system will be established as a desktop database, which requires a prime database administrator to maintain and populate the database, and make modifications, if necessary. In general, the primary qualities of desktop database are as follows:

- Requires database software for any users and administrators
- Database file is portable and easily copied
- Database may be located on any network or local computer
- Allows multiple users, generally those with local access to the network
- Data back-up is dependent on network back-up or manual back-up
- Although security features are available, the desktop database is not as secure as a server database
- May not be suitable for extremely large sets of data
- Easier to maintain, but easier to corrupt
- Has built-in features for building queries, forms, modules, and reports
- Can be integrated with other desktop applications (e.g., Excel).

2.3.2 EA Standard Software

The environmental data management and tracking software utilized during the project will be the latest version of Scribe which was developed by the USEPA Environmental Response Team.

2.4 PROCESSING OF ANALYTICAL DATA INTO DATABASE SYSTEM

The cornerstone of importing and storing chemical analysis data is the laboratory EDD file that contains the data. The EDD is a simple, flat data file, typically in Microsoft Excel or delimited text format. However, the EDD will not contain all the necessary task order information (e.g., sample location and site, field sample duplicate identities, sample depths, etc.). Successful data processing relies on integrating the EDD and external information for import to the database. The Project Manager is responsible for supplying the necessary external information.

There are also many decisions to make regarding the level of data review and completeness checking of the EDD. The basic steps involved in processing the sample data are as follows:

- Establish EDD field definitions and delivery requirements with the laboratory
- Determine level of EDD/data review with the project manager
- Obtain other necessary task order information from the Project Manager
- Review/refine import automation and coding for each task order
- Generate import summary report to confirm import.

Each of these steps is discussed in detail below.

2.4.1 Establish Electronic Data Deliverable Structure and Contents

A suggested example of an EDD is presented in Table 2. After the EDD structure is established, there are several questions that must be answered by the Project Manager regarding actual data delivered and how it will be stored:

- Determine if the EDD will contain all dilutions, re-analyses: If the EDD will have dilutions and re-analyses, the data manager will have to "reduce" the EDD data to the select the final result to be used if multiple results are available for a given sample and analyte.

- Determine if the task order will require validated EDDs: Validated EDDs will have diluted and re-analysis results flagged to indicate the final result to use. Will the task order require storage of both validated and invalidated EDDs?

- Should the EDD data contain only field samples, or will any of the following be included:
  - Matrix spikes
  - Laboratory duplicates
  - Surrogate recoveries
  - Laboratory control data (e.g., laboratory blanks, calibration, laboratory control samples)
  - Tentatively identified compounds.

- What are the final concentration units to be used in the database?

- Will there be the same analytes analyzed by more than one type of method (e.g., laboratory analysis)?

- Will non-detected data be reported to the method detection limit or reporting limit?

TABLE 2 EXAMPLE ELECTRONIC DATA DELIVERABLE FILE AND DATA

Columns 1 to 12:

REPORT	LAB_SAMPID	SAMP_TYPE	DIL_FACTOR	FLD_SAMPID	SAMPLE_DATE	REC_DATE	EXT_DATE	ANAL_DATE	LAB_MATRIX	MOISTURE	WET_DRY
C5L190133	L99546	N	1	ABC-1	12/16/2005	12/17/2005	12/21/2005	12/22/2005	SOIL	18	WET
C5L190133	L99546	N	1	ABC-1	12/16/2005	12/17/2005	12/17/2005	12/21/2005	SOIL	18	DRY
C5L190133	L99546	N	1	ABC-1	12/16/2005	12/17/2005	12/17/2005	12/21/2005	SOIL	18	DRY
C5L190133	L99546	N	1	ABC-1	12/16/2005	12/17/2005	12/17/2005	12/21/2005	SOIL	18	DRY

Columns 13 to 23:

AN_METHOD	PREP_METHOD	ANALYTE	CAS_NUMBER	TOT_DISS	LAB_RESULT	QUAL	REP_LIMIT	MDL	UNITS	BATCH_ID
WW 160.3 MOD	160.3 MOD	PERCENT SOLIDS	Q1082	N	82			0	%	5355308
ILM05.4	SW846	LEAD	7439-92-1	N	25	J	50	50	MG/KG	5357419
ILM05.4	SW846	LEAD	7439-92-1	N	300		50	50	MG/KG	5357419
ILM05.4	SW846	LEAD	7439-92-1	N	1200		100	50	MG/KG	5357419

There may be other EDD contents the Project Manager may require for final storage in the database. Proper planning of the EDD structure and contents is a key first step.

2.4.2 Electronic Data Deliverable Review

The Project Manager must determine what level of review is required for the EDDs. The level of quality control can range from a full completeness check to a simple check for redundant data prior to import. Even validated EDDs may have issues that require review.

For a completeness check, the Project Manager must supply a list of all expected samples, methods, analytes, and detection limits. Ideally, this information is loaded into an external electronic file and used to check the EDD for completeness.

If the EDD contains dilutions and re-analyses, and is not being validated to reduce the results, the data manager must confirm with the Project Manager which results should be selected as final.

Ideally, the Project Manager will supply a list of expected field samples that define the locations, areas of concern, sample types, matrices, depths, sampling dates, and any other information required to be stored in the database that relates to the samples. This external list is used to check handwriting transcription errors that occur between the chain-of-custody and the laboratory data system. It is common for the letter "O" and zeros to be confused, the letter "S" to become a number "5", etc. Only a manual check of the names to a master list can identify these issues.

The EDD must be reviewed to locate any situations where the same sample, same method, and the same analyte are reported more than once (i.e., duplicate analytical results). It must also be screened for missing data.

If any problems are encountered with the EDD, the laboratory must be contacted. The EDD must be corrected and re-issued from the laboratory. The hard copy laboratory report must also be reviewed. Ideally, the hard copy laboratory report and the EDD contents must be identical.

2.4.3 Obtain Project Sample Information

The laboratory EDD will not contain all of the necessary sample information. Field sample names may range widely in the encrypted information they contain. Some field sample names may indicate location point, depth, and matrix, or other samples may have a coded system of numbers that require external information to extract the location, depth, and matrix information. The identity of field duplicates is also not given in the EDD. There may be additional location coordinate information or special sample "categories" that need to be addressed during storage.

The external information is captured in an electronic file that is later combined with the EDD for import into the database.

2.4.4 Review and Refine Import Automation

After the EDD has been reviewed and the additional information from the project manager has been gathered, the import process may begin. Because the database consists of a series of related parent and child tables, the data in the EDD must be imported in the proper order: site, location, samples, sample tests, and results.

In addition to the order, all of the reference values must be checked for standardization in each table. For example, the analyte names must be in the analyte reference list, the concentration units must be in the unit reference list, the methods must be in the method reference lists, etc. If a value not in a list is found, it must be determined if the item is a new one that must be added to the reference list, or if it is a spelling error or variation of an item already on a reference list.

The import process is an automated sequence of events that may be refined for each task order to accommodate the details of each task order. In general, the import process must address several general issues:

- Import data in order to each parent and child table
- Check fields for reference values where relevant
- Add new values to reference tables when needed
- Identify missing required values
- Identify duplicated information
- Incorporate external sample information (non-EDD sample information).

2.4.5 Confirm Data Import

After the data are imported into the database, a summary report is generated to ensure the proper number of results have been stored for the imported EDD. The summary includes the sample identities, test methods, and number of results for each test. A detailed report can also be generated if a greater level of detail is to be checked.

3. GEOGRAPHIC INFORMATION SYSTEMS

GIS has proven to be a vital tool in the management and analysis of spatial data collected for a wide range of task orders. Sources of information that can be integrated and managed in a GIS are tabular, Global Positioning System, computer-aided design drawings, images, surface models, electronic documents, and scanned hard copy documents. GIS allows this information to be queried, processed, and analyzed, assisting users with interpreting data and presenting their findings visually in reports, public relation events, and meetings.

3.1 GEOGRAPHIC INFORMATION SYSTEM DATA FORMAT

Spatial data are segregated into individual feature layers, which are a collection of points, polylines, polygons, or grids. A point layer could contain a collection of monitoring wells, a polyline layer could represent a stream, a polygon layer could be a collection of buildings, and a grid could represent a surface elevation model. By placing spatial data in this format, GIS can extrapolate data from each layer, either by query or by advanced spatial analysis techniques (e.g., feature buffering, polygon overlay, surface modeling of numeric data, and proximity analysis).

Feature layers store attribute data as part of their design. Attribute data consist of geometry calculations such as length for polylines, area for polygons, and coordinates for points. Additionally, any feature or task order-specific descriptive attributes associated with individual features can be stored within the feature layer or in tables linked to the feature by a unique identifier.

Feature layers are formatted to the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE). SDSFIE format provides a standardized scheme for attributes and databases to which all GIS layers must adhere, thereby ensuring compatibility. This format dictates the specifications and structure for attribute tables and fields that are associated with the geometric features (e.g., buildings, wells, wetlands, etc.). The SDSFIE standard is compliant with the Federal Geographic Data Committee, which is responsible for developing the Content Standard for Digital Geospatial Metadata. This ensures GIS data to be compatible with Federal GIS.

3.2 GEOGRAPHIC INFORMATION SYSTEM DATA STORAGE

Feature layers can be stored in several formats depending on the complexity of the Site, the data to be collected, and how many users will be processing data. Each format contains the geometry and attributes data that are associated with each feature. The formats, discussed in detail below, are shape files, coverages, and feature classes.

3.2.1 Shape Files

Shape files are the most basic format used to store GIS data. Each layer is made up of several files, which contain the geometry, attribute data, and a link between the data and geometry for each feature.

3.2.2 Coverages

Coverages consist of a combination of system directories containing sub-files, which hold geometry, attribute data, and projection information.

3.2.3 Feature Classes

Feature classes are the format in which layers are stored in a geo-spatial database. When imported into a geo-spatial database, shape files and coverages become feature classes. Feature classes will be stored in a personal geo-database, which is a desktop relational database that stores multiple feature classes, tables, and images. Personal geo-spatial databases allow only one user at a time to access the database and have a limit on how large they can grow, with performance decreasing as the size of the database increases.

3.2.4 EA Standard Software

EA utilizes Environmental Systems Research Institute, Inc. (ESRI) software as its standard GIS software (i.e., ESRI ArcGIS Desktop 9.2). ESRI is an industry standard for GIS and spatial data systems, which can store and access data.

3.3 ACCESSING GEOGRAPHIC INFORMATION SYSTEM DATA

End users will access GIS data through a desktop application. A prime GIS administrator will maintain the GIS data and will make modifications if necessary. In general terms, the main qualities of a desktop GIS application are as follows:

- Requires GIS software for any users and administrators
- GIS data must be located on a network accessible by all users or must be easily transferred
- Users can easily view and process data
- Users can perform complex procedures such as spatial analysis, modeling, and cartographic output.